

## CBG FUELS

THE FUTURE FUEL



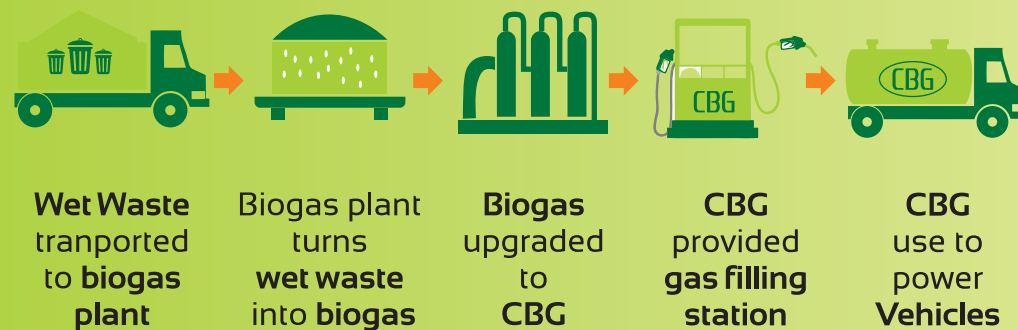
### Benefits of Compressed Bio Gas (CBG)

- ✓ Lowering pollution and carbon emission.
- ✓ Cheaper than other fuel.
- ✓ Import reduction of natural gas and crude.
- ✓ Providing a buffer against energy security concerns and crude/gas price fluctuations.
- ✓ Providing additional source of revenue to the farmers, rural employment and amelioration of the rural economy.
- ✓ Contribution towards Swachh Bharat Mission through responsible waste management.

#### Transformation of organic waste into Compressed Biogas (CBG)

**5,000**  
Compressed Bio Gas (CBG) Pump will be set up by 2023, says Dharmendra Pradhan

Minister of Petroleum and Natural Gas, Minister of Steel



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## ABOUT COMPANY

### Introduction

Our Objectives of the energy turnaround can only be achieved in an economically justifiable way if biomethane is used as an immediately available option to lower the carbon freight of the energy sector. In a future energy system that is increasingly fed by wind, solar and biomass, renewable gases like Biogas and trendsetting technologies like power-to-gas are essential.

### Our Mission

Our Mission To strive hard to achieve what has not been achieved hitherto and produce the world's best products & services in terms of quality, reliability and performance to serve the domain of biogas and solar energy, and translate our advanced technologies into value for our customers and stakeholders.

### Our Vision

We are committed to ensure that our comprehensive business solutions spearhead the renewable energy movement for a cleaner and greener environment globally, by aggressively capitalise the emerging Grid and Off Grid opportunities, biogas turnkey projects, biogas to biomethen (CNG) and biogas to electricity in appropriate collaboration with the world's leading renewable energy companies for delivering a comprehensive range of quality products and services that enrich the lives of our customers, employees, shareholders and the country at large.

### Our Core Values

#### Solution Focused:

Identify and offer effective solutions & challenges in the industry and at our facility.



#### Get it done:

Be persistent, focused and explore every option to get it done.



#### Commitment to Excellence:

We measure ourselves against the highest standards & Quality.



#### Customer Centric:

Customer satisfaction is our one true goal and our every action will revolve around driving true value to the customer.



#### Quality:

We never compromise on quality. Our products are tested thoroughly at every stage and hence are of highest quality.



#### Honesty:

"Honesty" to us means sincerity, truthfulness, fair & loyal with integrity.



## Biogas Future Energy

### Biogas from Waste

Disposal and treatment of biological waste represent a major challenge for the waste industry. For a wide range of organic substances from agriculture, foodstuff of feed industries, anaerobic digestion is a superior alternative to composting. Biogas – a mixture of both methane and carbon dioxide – is created during anaerobic digestion and serves as a high-energy renewable fuel that can be used as a substitute for fossil fuels. Biogas-fuelled gas engines improve waste management while maximising the use of an economical energy supply.



### Benefits of Biogas Plants

- Production of renewable power
- Treatment of a waste material
- Reduced carbon emissions
- Production of soil improver
- Cost effective proven technology



## Biogas Upgradation Technologies



### Water Scrubber >>>

Water scrubbing is used to remove carbon dioxide but also hydrogen sulphide from biogas since these gases are more soluble in water than methane. The absorption process is purely physical. Usually the biogas is pressurized and fed to the bottom of a packed column where water is fed on the top and so the absorption process is operated counter-currently.



### >>> PSA Purification Plant

Pressure swing adsorption, also known as PSA, is emerging as the most popular biogas upgradation technology in many parts of the world. A typical PSA system is composed of two or four vessels in series that are filled with adsorbent media which is capable of removing water vapor, CO<sub>2</sub>, N<sub>2</sub> and O<sub>2</sub> from the biogas stream.



### Membrane Biogas Separation >>>

The technology used to separate the two main components of biogas - methane and carbon dioxide - is based on the use of polymer membranes. This efficient system generates biomethane with a methane (CH<sub>4</sub>) content of between 96.5% and 99%, depending on its purpose.

## Biogas Generation from Sewage Sludge & Sewage Treatment Plant



Biogas is produced by anaerobic (oxygen free) digestion of organic materials such as sewage sludge animal waste, and municipal solid wastes (MSW).

The sewage sludge contains mainly proteins, sugars, detergents, phenols, and lipids. Sewage sludge also includes toxic and hazardous organic and inorganic pollutants sources. The digestion of municipal sewage sludge (MSS) occurs in three basic steps: acidogen, methanogens, and methanogens. During a 30-day digestion period, 80–85% of the biogas is produced in the first 15–18 days. Higher yields were observed within the temperature range of 30–60°C and pH range

of 5.5–8.5. The MSS contains low nitrogen and has carbon-to-nitrogen (C/N) ratios of around 40–70. The optimal C/N ratio for the AD should be between 25 and 35. C/N ratio of sludge in small-scale sewage plants is often low, so nitrogen can be added in an inorganic form (ammonia or in organic form) such as livestock manure, urea, or food wastes.

Potential production capacity of a biogas plant with a digestion chamber size of 500 m<sup>3</sup> was estimated as 20–36 × 10<sup>3</sup> Nm<sup>3</sup> biogas production per year.



*What we are trying to do is create a wastewater treatment plant that is, at a minimum, energy neutral, by minimising the power used on site, and maximising the production of biogas and energy from wastewater and organic waste. >>>>*



## H<sub>2</sub>S Removal System

The basic working principle of our H<sub>2</sub>S Removal System, the Scrubber can be viewed as a caustic type of Hydrogen Sulphide Removal System in which the spent caustic solution is continuously regenerated in a bioreactor.



The scrubbing liquid containing the sulphide is directed to the bioreactor where the sulphide is oxidized by aerobic microorganisms, of the group of the colourless sulphur bacteria, into the elemental bio sulphur.



From above equations the hydroxide used in the scrubber is regenerated in the biological step. The liquid entering the scrubber at the top is sulphide free, resulting in a high concentration difference between the gas & liquid phase. Consequently very high removal efficiencies, in excess of 99% can be easily obtained. The bleed stream consisting of sodium salts is sulphide free & can in most cases easily be discharged.

We have developed a nutrient feed as required for the microorganisms which perform the function separation of elemental sulphur from the Hydrogen Sulphide contained in the gas.

The Biogas Desulphurization system with added advantage of elemental sulphur recovery. Here in, valuable elemental sulphur is obtained as bi-product with purity of 80 - 90%. Sulphur has a number of applications various industries, it is used as fertilizer directly or additive to the fertilizers.

It is also utilized in making the fire crackers. Its purity can be improved in the range of 95 – 99% by using the Sulphur smelting process. The sulphur with high purity has special applications in sugar and pharmaceutical industry.



## Continuous Stirred-Tank Reactor (CSTR) Anaerobic Digester

The CSTR is a completely-mixed form of anaerobic reactor, designed to maximize the contact between the biomass and the waste, to optimize digestion performance. One of the oldest digester configurations, it is also one of the best in terms of applicability to different wastes. No waste is too strong to employ the technology and with two different operating modes and many different forms of biomass retention, the CSTR is an extremely flexible process.



The wastewater (wastewater/sludge mixture) enters the reactor at the bottom and leaves at the top and includes an internal recycle loop which draws reactor contents from the opposite side of the entry. Proper mixing by means of a top-entry, multi-stage agitator ensures that the influent is in constant contact with the biomass for optimal mass transfer and conversion of organic content (COD) to biogas. Depending on the application besides the top entry mixers, other solutions can be applied, such as side entry mixers or jet mixers.

### Key features of Anaerobic Digester

- Low to medium loading rates.
- No waste is too strong (organic content, COD). The system can handle sludge, slurries or other concentrated waste waters.
- Suitable for high fats, oil and grease (FOG) concentrations.
- Can manage very high suspended solids (TSS) concentrations (25,000 mg/L TSS).
- CSTR– M (mesophilic digestion: 35-40°C) suitable for high protein (nitrogen) content wastes.
- CSTR– T (thermophilic digestion process: 45-55°C) suitable for low protein (nitrogen) content wastes.





## The Process



Wastes from  
different Sources



Food & Organic  
Waste



Industry Waste



Animal Waste

Organic Fertilizer



Gas Holder



Without Scrubber



Biogas Burner for use in Boiler

Methane (60%-65%)

Scrubber



Biogas Engine

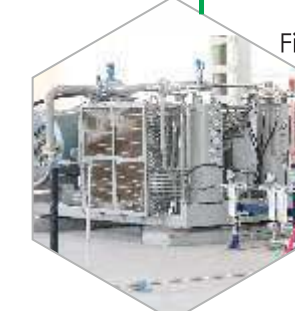


Export to Grid

Bio CNG  
Compressor



Bio CNG  
Filling Station



Methane  
(95%)



Purification System

Methane  
95%

Bio CNG Applications



Fuel for Transportation  
50% Bio CNG & 50% Diesel



Trolley & Truck Mounted BIO CNG  
Cascades for Transportation



Boilers



GENSET - Fuel using as  
70% BIO CNG & 30% Diesel



Industrial/Cutting Application

“ The Sustainable energy project could be a  
model for other entities to follow in the future.”





## Organic Fertilizer Using Sludge from Biogas Production

The sludge from biogas production can be used as organic fertilizer which functions as plant growth stimulator and bio-fungicide. Biogas residue fertilizer is not only with high quality, but also a good soil conditioner. According to the determination, applying biogas organic fertilizer can increase soil 0.17-0.6% of organic matter content, enhance 0.003-0.005% of total nitrogen and improve 0.01-0.03% of total phosphorus.



## Advantages of Organic Fertilizer:

In addition to releasing nutrients, as organic fertilizers break down, they improve the structure of the soil and increase its ability to hold water and nutrients. Over time, organic fertilizers will make your soil-and plants-healthy and strong.

There's little to no risk of toxic buildups of chemicals and salts that can be deadly to plants.

Organic fertilizers are renewable, biodegradable, sustainable, and environmentally friendly.

## Benefits of Organic Fertilizer

- Food produced is free from harmful chemicals.
- Easily bio-degradable and do not cause pollution
- Help maintain soil structure, fertility & increase soil nutrient holding capacity.
- Easy to prepare in Garden or farm



## Compressed Biogas (CBG)

CBG is made from fermented waste or other biological material, thus making it a CO2 neutral fuel. The fuel is mostly made up of methane, the other approx. 5 percent is made up of various gases. Compressed Biogas (CBG) is becoming an important part of the offerings for CO2 neutral fuel for vehicles.

## What We Provide

We provide CBG by following below parameters & specifications-

- 1) CBG will be free from liquids over the entire range of temperature and pressure encountered in storage and dispensing system
- b) The CBG will be free from particular matter such as dirt, dust etc.
- c) CBG delivered shall be odorized similar to a level found in local distribution
- d) Compressed Bio Gas (CBG) to be supplied shall meet IS 16087:2016 specifications of BIS (detailed below) and any other further revisions in the said specifications.

IS 16087 : 2016 STANDARD		
S. No.	Characteristics	Requirement
1	Methane Percentage (CH4) Minimum	90%*
2	Only Carbon Dioxide percentage (CO2), maximum	4%
3	Carbon Dioxide (CO2) + Nitrogen (N2) + Oxygen (O2) Percentage Maximum	10%
4	Total Sulphur (Including H2S) mg/m3, Maximum	0.5%
5	Total Sulphur (Including H2S) mg/m3, Maximum	20 mg/m3
6	Moisture mg/m3, maximum	5 mg/m3

\* However Purity of Methan Percentage is upto 97%

## Compression

&

## Bottling

